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Vol. 30, No. 3 March, 1949

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Forecast On Scale and Grasshopper Infestations for 1949 . . .

J. T. Griffiths, Jr. and W. L. Thompson

Florida Citrus Experiment Station, Lake Alfred, Florida

Scale Insects.—The coming season bids fair to be one in which growers will be plagued with excessive scale infestations. The past winter has been fine for the tourists as well as for both red and purple scales. In all sections of this citrus area, counts of purple scale populations indicate increases as high as 100 percent between December 1 and February 15. In general, it has been noted that both red and purple scale infestations have either held their own or increased during the winter months. The hatch of the first generation of scales has already commenced and this is a month to six weeks ahead of normal. This will probably mean at least an extra generation this year.

It is suggested that growers check scale populations carefully at the present time and that they prepare to apply control measures in March or April where heavy scale infestations are at all imminent. Oil sprays should be applied at a strength of 1.3% actual oil. Do not spray when the grove is suffering from drought.

No accurate guess as to bloom time can be made at present, but particularly in irrigated groves or where moisture has been satisfactory through January, it may be time to start melanose applications by mid-March. In the bulk of the groves, however, this spray application will probably be delayed until late March or early April. The timing of the melanose spray should be considered in planning a scale control program as oil may be used before bloom and followed with copper and wettable sulfur post-bloom; or a copper-oil emulsion may be applied post-bloom.

At the present time it appears that the greatest reduction of scales may be accomplished in early March. Checks on crawler activity for both species of scales show that high percentages of young scales will be present at that time. Thus, this spray will be timed to catch a maximum number of young scales. Also it will be applied when there is a minimum amount of foliage and complete coverage will be more easily obtained. Where DN has not been used, this application will also control any red spiders which might be present.

If Valencia oranges are involved, oil sprays will adversely affect the color. If they are already colored when oil is applied, they should be picked before they regreen. Of course, if it is anticipated that the crop will go to the cannery, the color factor need not be considered.

If a grower wishes to incorporate the oil spray with copper in the melanose application, a copper-oil emulsion may be used. This spray should go on as soon as practical after petal fall and it is recommended that it be applied within 10 days after the petals are on the ground. In no case should it be delayed more than 3 weeks after petal fall, or applied after the fruit is as large as 3-4" in diameter, because excessive fruit injury may result.

Oil sprays applied in March, April or May will not give satisfactory scale control throughout the summer and fall. **Therefore, a second oil spray should be planned for June or July.**

Grasshoppers.—Heavy bird grasshopper populations have overwintered in or near some groves in parts of Hardee, Polk, and Hillsborough counties. Similar situations may exist in isolated sections in other parts of the citrus belt. For this species **(Schistocerca americana)** egg laying has just begun or is about to begin. Hatching may be expected to commence by around April 1. The length of the egg incubation period will of course be dependent upon the kind of weather experienced during March.

Where grasshoppers are found to be present, considerable benefits may be obtained by absolutely clean cultivation. Groves which are not free of cover crop should be thoroughly disced as soon as possible. A state of clean cultivation should then be continued until late May or June. Clean cultivation accomplishes two purposes. It discourages the females from depositing eggs within a grove, and it also removes a food source for young grasshoppers when they hatch. The newly hatched hoppers are incapable of prolonged searches for food and thus most will perish in an effort to find it.

The use of insecticides for grasshoppers control is not recommended at this time of the year. Treatment with such materials should be delayed until such time as most eggs have hatched. In bearing groves either chlordane or toxaphene may be used. Benzene hexachloride may be used on young groves, but it should not be applied where fruit is present as it may impart an off flavor to the crop.

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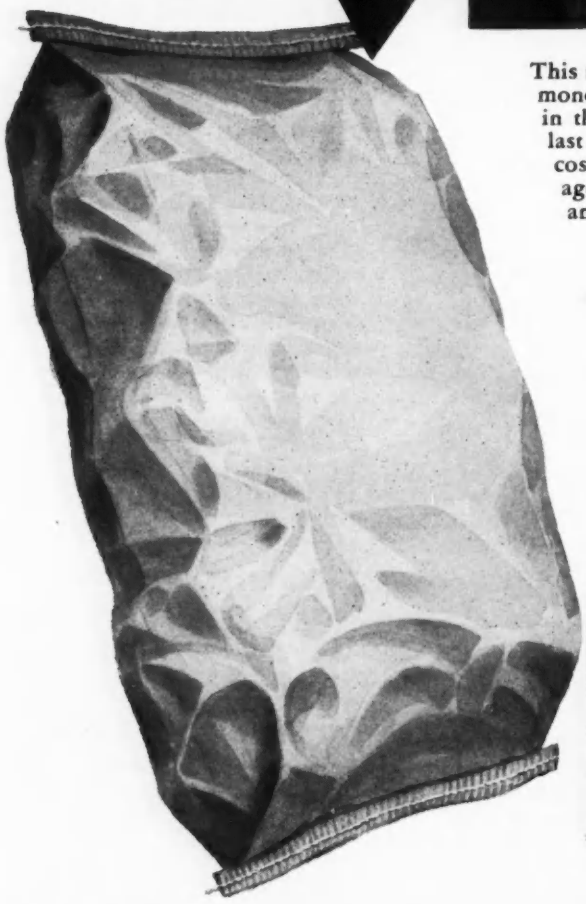

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Status of Parathion As Insecticide For Florida Citrus . . .

By
W. L. Thompson, C. R. Stearns, and J. T. Griffiths, Citrus Experiment Station, Lake Alfred, At meeting Florida State Horticultural Society

At the 1947 meeting of the Florida State Horticultural Society, Thompson and Griffiths (3) stated that of the newer insecticides which are being tested diethyl p-nitrophenyl thiophosphate, THIOSPHOS 3422, or parathion looked promising as a scalicide. Parathion has been accepted as the common name for this material, but it is being sold under various trade names. This paper is a progress report on some of the experimental work which has been done with parathion during the past year on the control of scale insects and mites infesting citrus trees. Parathion was used in the form of a wettable powder in all experiments.

Amounts,—Parathion will kill purple and Florida red scale, but the minimum amount to use for effective control has not been definitely determined. Results of preliminary tests indicated that .5 of a pound of the active ingredient per 100 gallons would be necessary for a maximum kill of purple scales, but more recent experiments showed that an amount between .15 and .30 pound per 100 gallons might be sufficient. There has been a consistently higher percentage of kill with 0.5 lb./100 gal. than with lesser amounts. Nevertheless, some very effective control has been obtained with the lower concentrations. In seven different experiments, the leaf infestation of purple scales was reduced with parathion at 0.5 lb./100 gal. on an average of 96 percent with a range of 92 to 99 percent. In five experiments, parathion at 0.3 lb./100 gal. reduced the scale infestations on an average of 91 per cent with a range of 79 to 99 percent. Where 0.2 lb./100 gal. was used in two experiments, the infestation was reduced 84 percent in one instance and 99 percent in the other, and where .15 lb./100 gal. was used, there was a reduction of 75 percent and 90 percent. An oil emulsion, at 1.3 percent actual oil, was used in five of these experiments and this caused an average reduction of 80 percent with a range of 56 percent to 94 percent.

W. L. THOMPSON

Florida red scales were as effectively controlled as purple scales with parathion, but fewer experiments were conducted for red scale control.

Compatibility. — Parathion was tested with most of the materials used in sprays applied to citrus trees. It was used in combination sprays containing wettable sulfur, neutral compounds of zinc and copper, DN (dinitro-o-cyclohexyl phenol), neotran (bis(chlorophenoxy) methane) and borax. It was also tested in sprays containing zinc sulfate and/or manganese sulfate which were neutralized with hydrated lime. According to the manufacturer, parathion should not be used in strongly alkaline solutions. Consequently, the minimum amount of lime was used

to neutralize zinc sulfate and manganese sulfate. Where zinc sulfate was used, the hydrated lime was used at a ratio of 1 part of lime by weight to 3 parts of zinc sulfate. Where zinc sulfate and manganese sulfate were mixed in the same spray, the hydrated lime was added at a ratio of 1.1 pound to 3 pounds of zinc sulfate plus 3 pounds of manganese sulfate or an approximate ratio of 1 to 5. Parathion was used at .5 pounds per 100 gallons in all of the combination sprays. They were applied on pineapple orange trees as dormant sprays and on grapefruit trees as post-bloom sprays.

Satisfactory control was obtained in all of the plots where the dormant combination sprays were applied (See Table 1). Six weeks after the dormant combination sprays had been applied there was an average reduction where an oil emulsion had been applied, and a 42 percent increase of infested leaves in the unsprayed plots. Satisfactory control was also obtained with the parathion in combination sprays at post-bloom time. A 93 percent reduction of leaves infested with purple scale was obtained where parathion was included in a combination spray containing a neutral copper, zinc sulfate, lime, borax, neotran and wettable sulfur. Such a combination would not be practical with an oil emulsion. In the same experiment, where a combination copper-oil emulsion at 1.3 percent actual oil was used, the infested leaves were reduced 84 percent. In August or about five months after the spray another examination of leaves was made and the degree of reinfestation was about the same in plots where parathion was used as in plots sprayed with an oil emulsion.

Timing. — Definite recommendations for the timing of parathion sprays for scale control cannot be made at this time, but results obtained to date indicate that for seasonal control the summer applications were the most satisfactory. By October 1 there was a higher percentage of infested leaves where either a dormant or a post-bloom parathion spray had been applied than on plots sprayed between June 28 and August 31. Excellent control of purple and red scale was obtained with 0.5 lb. of parathion plus 10 lbs. of wettable sulfur per 100 gallons where this was applied on duplicate plots on June 28, August 2, and August 31, respectively. Adjacent plots were sprayed with an oil emulsion (1.3 percent actual oil) on the same dates, but the control of scale on those plots was not as satisfactory as where parathion was used (See Table 2). Whitefly control was somewhat more satisfactory where the applications were made on either August 2 or August 31 than where they were made on June 28.

Apparently the timing of parathion sprays will not delay the degreening of fruit since grapefruit from trees sprayed with parathion generally colored sooner than fruit from oil sprayed trees. In one experiment a set of duplicate plots was sprayed with parathion on October 1, and another set of plots was sprayed with an oil emulsion. On October 4, or three days later, samples of fruit were picked and placed in the coloring room. After 54 hours in the coloring room, 94 percent of the fruit was well to fairly well colored from the parathion sprayed plots compared to 46 percent colored to the same degree from oil sprayed plots. At the end of a 72 hour period in the coloring room only 68 percent of the oil sprayed fruit had colored (See Table 2).

The relationship of the timing of parathion sprays to the percent soluble solids in fruit has not been definitely determined but according to some unpublished preliminary data of J. W. Sites* there was no indication that parathion prevented the formation of maximum solids where it was applied in June, August or October.

It seems possible that parathion may be used at any time of the year as far as any effect on the tree is concerned. However, until more information is obtained, it is advisable not to spray trees with fruit on them. Where the fruit has been picked, a dormant application may be made. This should be followed with a 1.3 percent oil emulsion spray during the summer or parathion may be used again if it is found that it can be applied with safety. Experimentally, a heavy infestation of purple scale was reduced to a minimum where parathion was combined with compounds of zinc, copper and wettable sulfur in a post-bloom spray and followed in July with a parathion-wettable sulfur spray.

Purple Mite Control with parathion was not as satisfactory as with some other miticides now in use. It killed a high percentage of the active mites, but reinfestation occurred within a short period of time after the application. Four days after a February spray was made, only a few purple mites were observed, but within 17 days reinfestations were apparent in 6 of the 7 plots where no other miticide was used. The period of control was much longer where either DN or

Table 1.
Control of Purple Scale where Parathion was Combined with Other Materials used as Sprays on Citrus

Materials in Pounds per 100 Gallons Parathion Expressed as Active Ingredients Sprays Applied February 6, 1948	Per Cent Decrease of Infested Leaves After Sprays		Per Cent Fruit Infested at Stem-End
	6 Weeks	28 Weeks	21 Weeks
Parathion .3, wettable sulfur 10	79	64	25
Parathion .4, wettable sulfur 10	91	70	10
Parathion .5, wettable sulfur 10	98	83	9
Parathion .5	95	89	10
Parathion .5, wettable sulfur 10 DN 2/3 [1]	87	57	5
Parathion .5, zinc sulfate 3, lime 1, wettable sulfur 10	81	64	9
Parathion .5, basic copper 3, [2] wettable sulfur 10	98	58	22
Parathion .5, basic copper 3, wettable sulfur 10	88	6	6
Parathion .5, basic copper 3, neutral zinc 2, wettable sulfur 10	96	88	No Record
Parathion .5, zinc sulfate 3, manganese sulfate 3, lime 1.1, wettable sulfur 10	87	52	11
Oil emulsion (1.3% actual oil in dilute spray)	58	77	25
No theatment	+42		56

1 DN—40% dinitro-o-cyclohexyl phenol
2 Basic copper—34% metalic copper

Neotran was included in the spray or where an oil emulsion was used (See Table 3). A November application of parathion was not as effective as the sprays applied in February. In the November experiment there was a higher percentage of infested leaves when the sprays were applied than existed in February which may have been a factor in the lower percentage of control. However, the control obtained with either DN or Neotran was more satisfactory than where parathion was used. (See Table 4).

Rust Mites were killed with parathion but the periods of control were of short duration. Nine days after the application there was a definite reduction, but within 24 days the trees were reinfested to a marked degree as compared with the slight reinfestation where wettable sulfur was used (See Table 4).

Other Insects. — Cloudy - winged Whitefly was controlled with parathion to about the same degree as with an oil emulsion. Neither of the June 28 applications of parathion or oil emulsions was as effective as August 2 or August 31 applications (See Table 2).

Citrus Mealybug infestations were effectively reduced. On April 19 an application of parathion at .5 pounds per 100 gallons was made on five orange trees. At that time 100 percent of the fruits examined were infested with mealybug under the calyx. On June 9 when the final examination was made, 98 percent of all fruits within reach were free of mealybugs on the sprayed trees as compared to 2 percent of mealybug free fruit on 10 untreated trees on each side of the sprayed ones. On the sprayed trees, the spring flush of foliage was free of "sooty mold" which also indicated the absence of mealybugs while there was an abundance of it on the unsprayed trees. On grapefruit trees, which were sprayed on June 28 the control was not quite so satisfactory where the mealybugs had become massed between fruit hanging in clusters, but the control was much more satisfactory than with an oil emulsion. In connection with mealybug control, it was observed that where parathion was used, all of the pink scavenger worms, **Pyroderces rileyi** Wlsm., were killed. These worms are usually associated with mealybug and sometimes purple scale infestations. The control of these worms would be an additional benefit since they sometimes eat into the peel of the fruit and may cause considerable damage.

Limited tests have been made for the control of cottony-cushion scale, the green citrus aphid and the bird grasshoper (2) and in each case a high percentage of kill was obtained. It remains to be seen what effect parathion will have on the biological control of insects and mites when whole groves have been sprayed. Where parathion was applied, many dead lady-bugs were observed, but where an oil emulsion spray had been applied on trees

Table 2
Timing Experiments on Grapefruit with Parathion and Oil Emulsion in Relationship to the Control of Purple Scale, Florida Red Scale, Cloudywing Whitefly and Degreening of Fruit.

All Figures are Expressed in Average per cent of Duplicate Plots

Insecticides	Spray Dates	No. Days Between Sprays and Spray Counts	Purple Scale			Florida Red Scale			Whitefly	Degreening Fruit	
			Infested Before Spray	Leaves After Spray	Increase or Decrease	Infested Before Spray	Leaves After Spray	Increase or Decrease	Infested Leaves After Spray	Well to Fairly Well Colored	
										54 Hrs. in Coloring Room	74 Hrs. in Coloring Room
Parathion .5 lbs. Plus Wettable Sulfur 10 lbs.— 100 Gallons Oil Emulsion 1.3% Actual Oil											
Parathion	June 28	99	6.5	.5	—92	.6	.2	—67	6.0	99	100
Oil emulsion	June 28	99	11.8	20.8	+76	4.1	2.6	—37	4.0	88	97
Parathion	Aug. 2	64	29.3	.8	—98	10.1	.2	—98	1.0	97	100
Oil emulsion	Aug. 2	64	20.3	19.8	— .2	5.3	1.1	—79	1.3	81	97
Parathion	Aug. 31	35	61.4	.4	—99	8.6	.2	—98	.6	74	90
Oil emulsion	Aug. 31	35	41.6	5.2	—88	6.3	.5	—92	.6	83	92
Parathion	Oct. 1	20	52.8	2.5	—95	11.7	1.1	—91	1.6	92*	98
Oil emulsion	Oct. 1	20	65.0	25.1	—61	14.6	5.5	—62	1.5	46*	68
No Treatment		99	26.0	55.2	+53					79	94

* Picked 3 days after treatment.

in the same block very few dead beetles were found. However, within a week after the application, living beetles were observed on the parathion sprayed trees. The results to date indicate that neither Florida red scale nor purple scale have reinfested citrus trees any sooner following parathion sprays than where an oil emulsion had been applied. The effect on scale parasites has not been determined, but apparently the parathion residue dissipates in a few days, and it seems unlikely that it will have the same residual effect in scale parasites that DDT has. Griffiths and Stearns (1) reported that appreciable amounts of DDT were recovered from leaves 4 weeks after an application; whereas, the results of recent experiments indicate that 80 to 90 percent of the parathion had dissipated in about three days during warm weather.

Residue Studies. — In a limited number of analyses made of parathion residue on leaves, it was found that during warm weather a high percentage of it disappeared in a few days. On October 1, an application was made of parathion at .5 pound per 100 gallons on orange trees. A sample of leaves was collected after the spray had dried and on each of the three succeeding days samples of leaves were collected and analyses were made of the residue. Rain fell on the fourth day so no further analyses were made. Three days after the application approximately 90 percent of the parathion had disappeared on outside foliage and 80 percent on inside foliage. Results of other analyses made a month or more after an application showed that a small amount of parathion was still present but it is the opinion of the writers that the amount recovered a month after spraying was parathion which had been absorbed by the leaves and was not a surface residue.

Analyses were made of the juice and peel of Parson Brown oranges to check on the penetration of parathion. On September 18, analyses were made of juice of the oranges picked from trees which had been sprayed on different dates with parathion at 1.0 lb. of the active ingredient per 100 gallons. Where the spray had been applied on the respective plots on March 15, April 1, June 1, and July 1, no trace of parathion was found. However, a trace was found in the juice of fruit from trees sprayed on May 1, August 1 and September 1. On October 13, analyses were made of the peel of the Parson Brown oranges from the respective plots. No trace of parathion was found in the peel where the spray was applied on March 15, which was during the period of petal fall, but amounts ranging from 0.3 to 2.0 parts per million were recovered in the peel where the spray was applied on successive plots the first of each month from April 1 to September 1, inclusive (See Table 5).

One series of analyses was made of the juice and peel of grapefruit that had been sprayed with parathion at .5 pounds per 100 gallons on April 6 or approximately 3 weeks after the fruit had set. On September 28 the juice was analyzed and on October 19 an analysis was made of the peel for parathion. No parathion was found in the juice but small amounts ranging from 0.1 to 0.3 ppm were found in the peel. In one plot which had been sprayed on August 2 with parathion at 0.25

(Continued on page 12)

Table 3.
Purple Mite Control on Pineapple Oranges
Figures Expressed Percent of Infested Leaves
Sprayed Feb. 6, 1948

Materials per 100 Gallons Parathion Expressed as Active Ingredients	Pre-Spray 1-22	Pre-Spray 2-10	Post Spray 2-23	Post Spray 3-13
Parathion .3 lbs.—W. Sulfur 10 lbs.	12.5	2.5	6.3	15.0
Parathion .4 lbs.—W. Sulfur 10 lbs.	6.2	0	13.8	10.0
Parathion .5 lbs.—W. Sulfur 10 lbs.	8.8	0	12.5	34.0
Parathion .5 lbs.	6.3	0	8.8	13.0
Parathion .5 lbs.—W.Sulfur 10 lbs. DN 2/3 lbs.	16.3	0	1.3	5.0
Parathion .5 lbs.—W. Sulfur 10 lbs.—Neotran	13.8	0	0	6
Parathion .5 lbs.—Copofilm 3 lbs.— W. Sulprur 10 lbs.	25.0	2.5	21.0	24.0
Parathion .5 lbs.—$ZnSO_4$ 3 lbs.—$MnSO_4$ 3 lbs.—Lime 1.1 lbs.—W. Sulfur 10 lbs.	20.0	0	0	4.0
Oil Emulsion 1.3% Actual Oil	20.0	0	2.5	9.0
No Treatment			53.1	44.0

Table 4.
Purple Mite and Rust Mite Control
Sprayed November 14, 1947

Figures Express Percent Infested Leaves

Dilutions—Pounds per 100 Gallons	Purple Mite Pre-Spray	Purple Mite Nov. 25	Purple Mite Dec. 19	Purple Mite Jan. 22	Rust Mite Pre-Spray	Rust Mite Nov. 25	Rust Mite Dec. 19	Rust Mite Jan. 22
Parathion 2.6	9	6	10	27	56	8	43	16
Parathion 2.0	10	9	26	26	58	5	39	34
Parathion 2.0	26	2	24	31	43	5	35	17
Toxaphene 2.65	41	3	16	43	60	11	29	30
Neotran 2.0	48	2	5	8	70	4	88	20
Neotran 2.5	11	0	0	4	55	10	47	12
Neotran 2.0 W. Sulfur 10.0	1	0	0	1	45	1	12	1
Neotran 2.5 W. Sulfur 10.0	1	0	0	2	52	3	4	2
DN .66	2	0	1	3	50	12	41	24
DN .66 W. Sulfur 10.0	55	0	0	2	46	1	7	6
W. Sulfur 10.0	15	20	35	51	48	2	19	3
No Treatment	9	9	13	17	42	59	92	87

Parathion—25% Wettable
W. Sulfur—90% Wettable Sulfur
Toxaphene—33% Wettable Chlorinated Camphene
DN—40% Wettable dinitro-o-cyclohexyl phenol
Neotran—40% bis(P-chlorophenoxy) methane

Table 5.
Amounts of Parathion found in the Juice and Peel of Parson Brown Oranges following Sprays containing 1 pound of the Active Ingredient per 100 Gallons

		Spray Dates Mar. 15	April 1	May 1	June 1	July 1	Aug. 1	Sept. 1
Parts per Million	Juice	0.0	0.0	0.02	0.0	0.0	0.01	0.01
	Peel	0.0	0.3	2.00	1.0	0.7	2.0	2.0

Dates of analyses, Juice, September 18; Peel, October 13.

Effect of Methods of Application On Copper, Sulphur and Oil Deposits Obtained By Spraying and Dusting . . .

by
C. R. Stearns, Jr., W. L. Thompson and J. T. Griffiths, Citrus Experiment Station, Lake Alfred, Florida at meeting Florida State Horticultural Society.

The problem of applying spray and dust materials is an important one. The effectiveness of any given application may be determined not only by the amount or kind of material used, but also and probably of greater importance, by the thoroughness of the application. The data presented below were collected from a series of different experiments. They emphasize the fact that initial average deposit is not always a criterion of the effectiveness of the treatment, and that control is dependent upon complete coverage and thoroughness of application.

Copper Deposits

Two experiments concerned with copper are reported below. One was designed to study melanose control on grapefruit trees. It compared the effectiveness of several proprietary copper-oil emulsions with a bordeaux (3-3-100) spray and with a copper oxychloride material. The plots were randomized and in duplicate. They were sprayed on April 28, 1947. The copper oils and the copper oxychloride were used at the copper equivalent of a 3-3-100 bordeaux and the oils at 1.3 percent actual oil. The gallons applied per tree were essentially the same and all sprays were applied with conventional pressure spray equipment. Copper deposits were determined on the foliage as soon as the spray had dried and at the end of six weeks which period is usually considered the critical one for melanose infection. The fruit was picked and graded for melanose the following March.

The results as shown in Table 1 indicate that a higher amount of copper was deposited on foliage by the copper-oil emulsions and that following this type of application more copper remained during a longer period. It appears that the average amount of copper present on the foliage may not be the most important factor in controlling melanose, since no better melanose control was effected by the use of the copper-oils, and, in fact, the best control was obtained with the copper oxychloride material where there was less copper initially and throughout the critical period.

In the second experiment some plots of orange trees were sprayed with basic copper sulfate and wettable sulfur and others with a proprietary copper-oil (at copper equivalent of a 3-3-100 bordeaux and 1.3 percent oil). This experiment was originally designed as part of a scale insect study. However, due to an increase of purple mites (**Paratetranychus citri**), copper deposits were checked six months after the application. Results are presented in Table 2. As in the experiment described above considerably more copper was retained on those plots which were sprayed with copper-oil. The purple mite infestation was considerably higher on the copper-oil sprayed plots, and only the August 4 oil spray seemed to have materially reduced the purple mite infestation. No reason for the build up of purple mites can be deduced at this time, but this experiment appears to substantiate field observations which indicated that purple mite infestations in the fall of the year often follow spring applications of copper-oil sprays.

Table 1. Copper-oil Versus Copper-Wettable Sulfur Sprays on Grapefruit

Material 1	Copper Deposits mcg/cm 2 April 28	June 9	Percent No. 1 Fruit 2
Neutral Copper 3	4.7	1.3	71.7
Bordeaux (3-3-100)	5.0	1.8	60.5
Copper Oil A	7.3	5.7	60.9
Copper Oil B	6.7	5.0	57.8
Copper Oil C	5.5	3.9	61.5
Copper Oil D	7.0	3.8	56.5

1 Dilutions made on basis with metallic copper content contained in 3-3-100 Bordeaux
2 Figures obtained from Dr. R. F. Suit, Pathologist, Citrus Experiment Station.
3 A Copper oxychloride material.

Sulfur Deposits

In January of 1948 an experiment was prepared to study different methods for the application of sulfur. Three types of dusters were compared with the Speed Sprayer (model 36) application. The conventional two tube duster and the Master Fan Duster were operated at approximately 3 miles per hour while the third type, the airplane, was flown at about 75 to 80 miles per hour. The Speed Sprayer with the double head attachment was driven at a speed of 1.3 miles per hour. The materials were applied to both sides of the trees by all applicator equipment except by the airplane which was flown over the top of each row of trees. The amounts of sulfur applied by the various applicators varied between 1.4 and 1.6 pounds per tree. The data on materials used, the deposits of sulfur obtained, and the rust mite control are recorded in Table 3. The final analysis of sulfur deposits was made 33 days after the application while the final rust mite inspections were made 81 days after the application.

Commercial control of rust mites was obtained with all applications. However, the sprays gave better results than the dusts. After 81 days the range of infested leaves on sprayed plots was from 2 to 6 percent while a range of 5 to 21 percent was obtained in the dust plots. This difference can be partially explained by the fact that the sulfur was distributed over both the upper and lower surfaces of the leaves when applied as a spray, whereas when applied as a dust, a high percentage of the sulfur was on the upper leaf surfaces. There was no

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The Citrus Industry

with which is merged The Citrus Leaf
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FLORIDA CITRUS MUTUAL GOES "OVER THE TOP"

Florida Citrus Mutual, the state's super-cooperative citrus organization, after weary months of strenuous effort has finally gone "over the top" in its effort to sign up seventy-five percent of the citrus tonnage of the state. This announcement was made at a meeting of the temporary board of directors in Lakeland on February 28. Not only has the original goal been reached, but the report of the organization committee shows that fully seventy-nine percent of the tonnage has been signed with additional tonnage promised but not included in the official report of the committee.

This announcement is indeed good news for the citrus growers of Florida and for every citizen of the state. It marks a page in citrus history for which the industry has striven over the years — hitherto without success.

The organizational committee has been working for many months against numerous difficulties and discouragements, but its members have never lost confidence that their efforts would eventually meet with success. At the outset, many growers made objection to the original set-up. To meet these objections, a compromise set of by-laws was adopted and the campaign for members went ahead. While everyone connected in any way with the industry felt that organization was needed, there were many divergent views as to the kind of organization. Certain factors in the by-products industry were either opposed to or lukewarm toward the proposal of an over-all organization embracing all factors of the industry. Latterly, the disastrous effects of frost damage in both California and Texas, resulting in higher prices for the Florida product, tended to keep some growers who were disposed to join Mutual to delay in signing up.

It was the same old story so often repeated in the Florida citrus industry: — when prices were high, the need for organization has not been felt; when prices are low, there are too many suggested remediees and it has taken too long to effect a strong statewide organization. However, the need for organization is quite as much as before nature stepped in to aid Florida growers by curtailing the offerings of our principal competitors. A glance at the record will show that Florida citrus growers have experienced periods of high prices and seasons of less-than-cost returns. During these latter periods the industry has always suffered from lack of organization.

Now that Florida Citrus Mutual has become an established fact, it gives the growers of the state for the first time in the history of the industry a strong statewide organization with power to control distribution and to exert its powers for the stabilization of prices.

Now that the official declaration that Florida Citrus Mutual has attained its goal has been made, call has been issued for election of three permanent directors from each of the seven districts into which the citrus producing area of the state is divided. Upon the election of these 21 directors, final permanent organization will be completed. Tentative plans for the operation of Mutual have been drawn and it should not require great length of time to put the organization into effective operation.

It is to be regretted that the completion of this statewide organization has been so long delayed, that it was not in operation in time to control the distribution of early and midseason oranges. But that is water over the dam. The thing to do now is to expedite the final organization and to give Mutual the concerted support of every element in the industry. The effect of its operation will be felt by every business and professional man in citrus territory directly, and by every resident of Florida indirectly. It is the one promise of orderly marketing in times of high prices and of price stabilization when recession threatens.

With Florida Citrus Mutual now officially become an actuality, the citrus growers of Florida and every citizen of the state are due for congratulation. We can look forward with confidence to meeting the next threat of price depression with an effective statewide organization, owned, operated and controlled by growers for growers.

CITRUS CROP SERIOUSLY SHORTENED BY DROUTH

Along with the frost damage to citrus crops in California and Texas, greatly reducing the production of those states, the long continued drouth in the southern half of the Florida citrus belt has seriously shortened the crop in this state. Reports from field men in the Southern counties indicate that droppage is seriously affecting the production of both oranges and grapefruit. Early estimates of total production have been greatly reduced, several million boxes having been lopped off by some of the most observant field men.

Taken in connection with the heavy losses sustained by California and Texas growers, this droppage in Florida is having, and will continue to have, its effect upon the available supply at Northern markets during the remainder of the season and should have a tendency to uphold prices if judgment is used in the distribution of shipments.

The efforts of the Florida Citrus Commission to control shipments through voluntary application of quota restrictions on shippers, has had a most stimulating effect upon prices in the auction markets.

EFFECT OF METHODS OF APPLICATION ON COPPER, SULPHUR AND OIL DEPOSITS OBTAINED BY SPRAYING AND DUSTING

(Continued from page 9)

correlation between the average amounts of sulfur deposited and the rust mite control obtained since the average amounts of sulfur deposited by the dust were as great or greater than those deposited by the sprays. Therefore, distribution and coverage of the tree with sulfur appeared to be the most important factor governing rust mite control.

In another experiment the uniformity of the sulfur deposited was determined where various methods of application were used. The Speed Sprayer with an average sulfur deposit of 61 gave the lowest standard deviation of + 16 while the Master Fan duster with an average sulfur deposit of 72 gave a standard deviation of + 24. The conventional duster gave the highest average sulfur deposit, but had the highest standard deviation which was + 56. The above results indicated that more uniform amounts of sulfur were deposited by the Speed Sprayer than by the dust applicators and therefore also suggest that distribution and coverage of the foliage is more important than the average amount of sulfur deposited.

Oil Deposits

Type of Spray Guns and Disc Size.—A comparison of double Boyce guns (2 nozzles) with the broom guns (4 nozzles) was made using the same spray machine, spray crew, pressure, water, and sources of oil. The sizes of the spray discs, however, were varied. The trees sprayed were fairly uniform and averaged around 17 to 18 feet high. About two-thirds of the spray was applied from the inside of the canopy of the trees. The samples for determination of oil deposits were collected as soon as the trees were dry. The results as shown in Table 4 indicate that the double Boyce guns fitted with 5-64 in. and 7-64 in. discs produced higher oil de-

Table 2.
A Correlation between Copper Deposits on Leaves and Purple Mite Infestations 6 Months After the Copper Applications

Plots	Copper Spray Combinations Applied May 6	Dates of Summer Oil Sprays	Copper Deposit On Foliage mcg/cm 2	Av.	Percent Leaves Infested with Purple Mites	Av.
5	Copper—W. Sulfur 1	——	1.6	1.8	10	8.0
23			1.9		6	
2	Copper—Oil 2	——	3.7	3.4	67	59.0
20			3.0		51	
8	Copper—W. Sulfur	June 3	2.7		27	
26			1.7	2.2	23	25
1	Copper—Oil	June 16	3.7	4.0	73	64
19			4.3		55	
12	Copper—W. Sulfur	July 14	2.5	1.8	2	6.0
30			1.2		10	
3	Copper—Oil	July 14	3.3	3.7	64	63.5
21			4.1		63	
13	Copper—W. Sulfur	Aug. 4	2	1.9	1	1
21			1.8		1	
4	Copper—Oil	Aug. 4	5	4.8	11	11
22			4.7		11	

1. Neutral copper (34% metallic Cu) @ 3—100+ wettable sulfur 12½—100.
2. Proprietary copper oil emulsion @ 2 gallons—100.

Table 3.
Rust Mite Control with Various Materials and Types of Applicators.

Type of Sprayer And Dusters	Materials and Dilutions per 100 Gallons	Sulfur Deposit mcg/cm 2 Outside Canopy Initial	Outside Canopy Final	Inside Canopy Initial	Inside Canopy Final	Percent Reductions of Rust Mite Infestations
Speed Sprayer	Lime-Sulfur 2 gals., w. sulfur [3] 5 lbs., DN 4* 2/3 lbs.	60	16	31	9	81
Speed Sprayer	W. sulfur 10 lbs., DN 2/3 lbs.	43	4	45	6	65
Conventional [1] Duster	1% DN—Sulfur dust	168	13	61	3	31
Master Fan Duster	1% DN—Sulfur dust	72	4	46	3	69
Airplane [2] Duster	1% DN—Sulfur dust	91	2	54	2	53
Speed Sprayer	Lime-sulfur 2 gals., w. sulfur 5 lbs., Neotran 5* 2 lbs.	72	16	62	22	76
Speed Sprayer	W. sulfur 10 lbs., Neotran 2 lbs.	58	2	49	6	85
Conventional Duster	4% Neotran 5—Sulfur dust	107	9	45	0	5
Master Fan Duster	4% Neotran—Sulfur dust	59	3	29	1	6
Airplane Duster	4% Neotran—Sulfur dust	61	4	29	3	14

1. Conventional duster—double flexible tube type.
2. Stearman PT 17.
3. W. sulfur=wettable sulfur.
4. DN—dinitro-o-cyclohexyl phenol.
5. Neotran—bis (P chlorphenoxy) methane.

* DN and Neotran used for purple mite control

posits in the top parts of the trees than did the smaller size. These differences can be explained by the fact that the double Boyce gun could be regulated to deliver a wide mist or a narrow stream with more force while the broom guns only deliver a wide mist which does not have enough force to properly deliver the spray to the top of the tree. These results partially confirm earlier work of Thompson (1) who made a study of the types of spray guns and determined the relative efficiencies by scale counting methods.

Table 4.
Oil Deposits Resulting from the Use of Different Spray Guns and Disc Size at County Grove, Fort Pierce.

Type of Spray Gun	Size of Disc	Oil Deposit mcg/cm 2 Lower Canopy		Top Canopy	
Broom-4 Noz.	5's	42		39	
" "	5's	56	46	37	30
Double Boyce	5's	48		25	
" "	5's	48	50	42	45
" "	7's	53		55	
" "	7's	52	46	54	56

In connection with the above experiment a survey of actual commercial application of oil sprays was made in an area where the broom guns were in general use. The types of spray machinery varied and this factor was not considered. However the types of spray guns, the disc sizes, and the resulting oil deposits are included in Table 5. In general, low amounts of oil were deposited in the top parts of the trees, and in most cases this was not the fault of the spray crews, but was due to the failure of the broom guns to deliver a sufficient amount of material to the top portions of the trees.

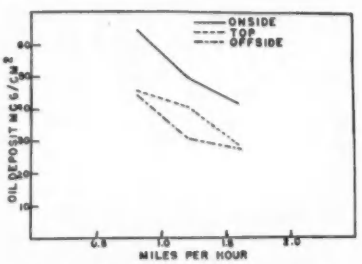

Figure 1. The Effect of Operating Speeds of the "Speed Sprayer" model 36 on Oil Deposits on the Inside Canopy of Tree.

Rate of Travel of Speed Sprayer (model 36).—The efficiency of the Speed Sprayer equipped with the single side or "oil-head" attachment was studied by operating the machine at speeds of 0-8, 1.2, and 1.6 miles per hour and then determining the amounts of oil deposited inside the canopy of the tree in three positions: on the onsides which are adjacent to the sprayer; the offsides which are perpendicular to the direction of travel; and the top. The trees sprayed were fairly uniform in shape and were 18 to 20 feet high. The gallonage delivered to each tree was approximately the same and was obtained by adjustment of the number of jets in the spray head. The plots were selected so that very little spray delivered to the trees at one speed would reach trees sprayed at another speed. The results as shown in Fig. 1 indicate that as the operating speed of the sprayer is increased the amounts of oil deposited on the inside canopy and in the top decrease in spite of the fect that the same relative gallonage was delivered to the trees at the different oprating speeds.

Table 5.
Oil Deposits from Various Groves Sprayed by Different Operators and Growers in the Fort Pierce and Vero Beach Area.

Grove Number	Typ of Spray Gun	Size of Disc.	Oil Deposit mcg/cm 2 Lower Canopy		Top Canopy
1	Broom-4 Noz.	3 & 4	33	26	—
2	" -3 "	4's	65	61	30
3	" -4 "	4's	44	42	—
4	" -3 "	3 & 4's	36		—
	Single	4	36		—
5	Broom-3 Noz.	4's	46	56	37
6	" -3 "	3's	30	52	42
7	" -4 "	3 & 4's	61	80	35
8	" -4 "	4 & 5s	47	42	6
9	Speed Sprayer	6/64	44	40	20
10	" "	6/64	70	63	—

Inside Canopy of Tree.

Summary

More copper was deposited initially and more was retained over a period of time where copper-oils were applied than where bordeaux (3-3-100) and a copper oxychloride material were applied. There was no correlation between average amounts of copper deposited and resulting melanose control.

Distribution and coverage are more important criteria for control of rust mites than initial average amounts of sulfur deposited. Sulfur sprays applied by the Speed Sprayer gave better control of rust mites than did sulfur dusts applied by either ground dusting equipment or by the airplane. More uniform amounts of sulfur were deposited by the Speed Sprayer than by the ground dusting equipment.

Double Boyce guns equipped with 5-64 in. and 7-64 in. spray discs gave higher oil deposits in the top parts of the tree than did the broom guns with 5-64 in. discs. Higher oil deposits in the top parts of trees were obtained with 7-64 in. discs than with 5-64 in. discs when both were used in double Boyce guns. The amounts of oil deposited on the inside canopy of the tree and in the top were decreased as operating speed of the Speed Sprayer was increased from 0.8 to 1.6 miles per hour although the gallonage applied per tree was approximately the same.

Figure 1. The Effect of Operating Speeds of the "Speed Sprayer" model 36 on Oil Deposits on the

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1. Thompson, W. L. Results of different methods of oil application for the control of scale insects on citrus. Proc. Fla. State Hort. Soc. 51:109 1938.

STATUS OF PARATHION AS INSECTICIDE FOR FLORIDA CITRUS

(Continued from page 8)

pounds per 100 gallons, there was 0.8 ppm in the peel.

It has not been determined, as yet, whether the small amount of parathion found in the peel may get into the juice when the fruit is processed. Before any recommendations can be made by the Citrus Experiment Station repeated tests must be made for the presence of parathion in the juice and peel of fresh and processed fruit. Addition-

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Domestic Use of Oranges Should Be Encouraged

By W. W. Yothers

It is pleasing to note that there is a great interest in the use of Florida citrus fruits at home. I believe that there is more interest now in this phase of marketing citrus fruits than at any time in the last 41 years. It is most fortunate that such interest exists, because of the enormous crop and prospects of increasing tonnage from year to year. Then, it should be remembered that the Florida orange does not have, in many instances, a very good appearance on the outside. This is due to wind blemishes, and various fungus diseases attacking the skin, and also several insect pests and mite enemies. Fortunately, these blemishes are on the rind only, and in only a few instances do they affect the juice characteristics, unless present to an enormous extent.

Fruit for juicing purposes should be left on the tree until it has attained such a degree of maturity as may be suitable or agreeable to the consumer. Of course, some individuals prefer very acid juice while others prefer fruit that is almost tasteless from the low citric acid content. On the whole, however, for domestic or home use, it is better to have fruit with high solids such as 10 or above, and only an average amount of acid. It is very soldom that an individual prefers sour fruit to sweet fruit. It is entirely unnecessary to subject fruit for juicing purposes to either the coloring rooms or to the color added process. Defective fruits, and especially those having the slightest indication of rot, should be thrown out. Of course, the fruit should be washed before the juice is extracted. It is better that the fruit should have a temperature below 80° before the juice is extracted. During really hot weather, it would be better to pre-cool the fruit.

After the juice has been extracted, it should be strained through a collander, and not through cheesecloth. Of course, if it is intended for babies, it will have to be strained through cloth. If the juice is intended for immediate consumption; that is, within a few minutes, it need not be put in the refrigerator; but it is a good practice and routine to follow to put the juice in the refrigerator at once. If the temperature is high and the oranges have not been pre-cooled, it would prevent enzymatic action in the juice to put it in small bottles or jars so that it would get cool in a short time. If the juice is in a gallon jug and has a temperature of 85° or above, the juice will be changed before it can get cool. If it is desired to carry on a little experiment with blends, these can be developed in countless numbers, varying the proportions of tangerine, orange, and grapefruit juice to suit an individual taste.

It is well known, of course, that sugar added to lemon juice makes a lemonade, and any sour citrus juice can be rendered palatable by the addition of a little sugar. It may be, also, that if the juice is too sweet, a few spoonfuls, per quart, of sour orange juice will improve it. If the public really knew how

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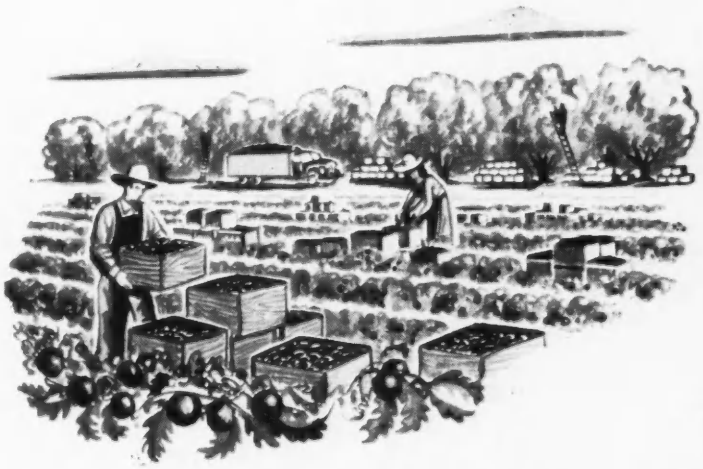

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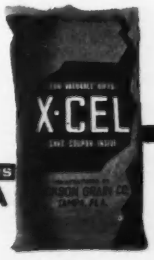

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good and delicious citrus juices are, we would not be troubled very long with large crops and poor sales.

In writing this, I realize that many of these suggestions are already practiced by many people, but I realize, also, that in some instances the most fundamental principles for obtaining good juice are violated. After 41 years here in Florida, I drink and eat oranges more and more every year, and they get better to my taste with every succeeding season.

STATUS OF PARATHION AS INSECTIDE FOR FLORIDA CITRUS

(Continued from page 12)

al information is also necessary in regard to concentrations, compatibility with other materials, effect on predators and parasites, and the effect on the trees under various weather conditions.

Summary.—Parathion killed Florida red scale and purple scale in concentrations varying from 0.15 to 0.5 pounds of the active ingredient per 100 gallons. It was effective for scale control when combined in sprays with neutral compounds of zinc and copper, wettable sulfur and borax. The toxicity of parathion did not appear to be seriously affected where the minimum amount of lime was used to neutralize zinc sulfate and manganese sulfate. The longest period of control of scale insects was obtained where the sprays were applied in either June, July or August. No relationship was found between the timing of parathion in either the degreening of fruit, formation of maximum solids in the juice of fruit, or shock to the trees. The active stages of purple mites and rust mites were killed, but the period of control was of short duration. Parathion was found to be toxic to mealybugs, cottony-cushion scale and lady beetles.

The residual effect of parathion on the leaves was of short duration. Zero to a trace of parathion was found in the juice of oranges and grapefruit, but slightly more was found in the peel.

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Fifty-four growers attended the recent Lake County grove tour arranged by County Agent R. E. Norris. They visited groves in which biological control of insects, high analysis fertilizers, and various cultivation practices are being demonstrated.

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New Harmone Lessens Frost Damage

Beverly Hills, Calif.—A new hormone which proves valuable in alleviating frost damage in plants was described to professional horticultural men here, meeting during a repetition of frost conditions which have hit this area to an unprecedented degree.

Noteworthly results in lessening severity of damage by frost through pre-treatment, and aiding recovery from frost through post-treatment were disclosed by John A. Armstrong Thomson of Los Angeles.

Thomson is president of the Vitamin Institute, and winner of the Science and Industry Gold Medal at the San Francisco World's Fair in 1940. He has introduced numerous new methods for causing plant life to "change its mind" on a wholesale scale, via the use of physiologically-active chemicals.

The hormone substance, designated "Horms No. 4", a compound of vitamins and hormones, has been used to treat tomato and other seedlings when planted in staggered rows with untreated plants, and in some plots where light frost ensued, the treated one survived and produced normal crops, whereas the untreated ones died, according to biochemist Thomson.

He said that the complete means by which the compound operates is as yet not fully understood very far beyond the knowledge that it cuts down shock and increases general strength of the plant material receiving it at time of planting, before a frost.

When used after a frost to help recovery of damaged plants, he stated, Horms No. 4 caused new root systems to start to form earlier, as well as new foliage, and enabled plants to use more of any available fertilizer materials, including soil and air nitrogen.

In addition the Horms No. 4, he said, has been found to cause earlier formation of blossoms on a number of varieties of plants, including tomatoes, roses, and a number of other food and ornamental plants. Fruits, truck crops and bedding plants of various sorts were listed by him among plants already show-

(Continued on page 22)

The Citrus Market Is Affected By Cold and Storms . . .

Such as have wreaked havoc with the citrus crops in California and Texas this season . . . . but we in Florida cannot afford to depend upon the misfortunes of other citrus growing areas of the United States for our prosperity.

Our problem lies in producing the finest possible crops of fruit at the lowest possible per box cost at which good quality fruit can be produced.

The outstanding record which our fertilizers have achieved in this respect is known to our customers . . . . many of whom are producing completely outstanding quantities of high quality fruit in their groves . . . . we will be glad to supply you with the names of numerous such growers if you are interested.

Naturally with heavy production and high quality such growers can and do receive good returns from their crops even when the market is not at its highest point.

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The Place of Citrus By-Products In The Feed Industry

Ralph L. Miller, Manager
Research & By-Products Dept.
Plymouth Citrus Growers Ass'n.
Plymouth, Florida

The development of the citrus canning industry in Florida has brought about the production of some 175,000 tons of very high quality cattle feed products.

During the past year, more than 35,000 tons of dried citrus pulp were produced. This was worth a gross amount of four million dollars. At the same time, some 40,000 tons of citrus molasses came from the press juice. This had a gross value of over a million dollars.

The five million dollars worth of pulp and molasses if fed properly, would produce roughly, 15 million dollars worth of beef cattle on today's market.

Many years ago, the research departments of the Florida Agricultural Experiment Station developed information regarding the value and use of citrus pulp and molasses. The use of and appreciation for these products have not kept pace with the research developed for they are not used as widely or sold for as much as they should depending on their value compared to other products.

Dried citrus pulp is not a roughage but a **carbohydrate concentrate.** Following is a typical analysis of dried citrus pulp and comparative cost per unit of total digestible nutrients as compared to similar feeds as shown in Table 1.

For many years, citrus pulp has been used for feeding both dairy and beef cattle with excellent results. It has abundant bulk, is highly digestible and is abundantly supplied with trace elements almost all of which are essential to animal growth.

Citrus molasses is almost half sugar, high in pectin and trace materials and on today's market, is the cheapest source of feed available. A typical analyses is shown in Table 2.

Citrus molasses can be fed readily when mixed in citrus pulp or other feeds such as alfalfa or peanut hay. It can be fed also in a trough alone and in this way, livestock eat it readily. One-half gallon per day per cow is not unusual with good results. It acts as a tonic and livestock develop a smooth glossy coat of hair when fed on citrus molasses.

Although both citrus pulp and citrus molasses have been fed successfully for many years, they have only recently found their place as ingredients in mixed feeds along with corn, wheat and oat products.

Almost two ears ago, Plymouth Citrus Growers Association's research department began testing mixtures of citrus pulp, citrus molasses, peanut meal, cottonseed meal, mineral mixture and urea in a 20% protein dairy feed. This mixture was compared to another 20% dairy feed and produced equal quantities of milk of similar quality, much more economically.

With this encouragement, other mixtures were tested and now there have been developed many combinations both with and without urea. The suggestions of Dr's. Becker and Kirk were followed very carefully both as to ingredients added and amount of citrus pulp fed. Since citrus feeds are naturally deficient in Vitamin A, a stable source of this vital material has been added to practically all mixtures in quantities sufficient to supply minimum

TABLE 1	Citrus Pulp or Meal (1)	Beet Pulp (2)	Snapped Corn (2)	Wheat Bran (2)	Oats (2)
Moisture	6.0 %	8.0 %	9.0 %	9.4 %	8.7 %
Digestible Protein	6.0 %	4.8 %	5.9 %	13.1 %	9.4 %
Fat	4.0 to 6 %	.8 %	3.2 %	5.0 %	4.7 %
Nitrogen-Free Extract	58.0 %	59.9 %	66.8 %	54.3 %	60.2 %
Fiber	12.0 %	18.8 %	10.4 %	6.0 %	10.6 %
Total Digestible Nutrients*	75.0 %	71.8 %	70.6 %	70.2 %	71.5 %
Mineral or Ash	5.0 %	3.5 %	1.9 %	6.0 %	3.6 %
Potash	.089 %	.18 %	Not listed	1.24 %	.40 %
Calcium	1.571 %	.68 %	Not listed	.12 %	.09 %
Magnesium	.514 %	Not listed	Not listed	Not listed	Not listed
Phosphorus	.012 %	.07 %	Not listed	1.32 %	.33 %
Iron	.015 %	Not listed	Not listed	Not listed	Not listed
Copper	.0004 %	Not listed	Not listed	Not listed	Not listed
Manganese	.0005 %	Not listed	Not listed	Not listed	Not listed
Zinc	.0016 %	Not listed	Not listed	Not listed	Not listed
Boron	.0025 %	Not listed	Not listed	Not listed	Not listed
*Unit cost per lb. T.D.N. f.o.b. production point	$.025	$.045	$.042	$.028	$.038
Unit cost per lb. T.D.N. f.o.b. New York	$.032	$.056	$.042	$.035	$.044

(T. D. N.—Total Digestible Nutrients)
(1) State Chemists' analyses, Florida Agricultural Experiment Station.
(2) From Morrison's "Feeds & Feeding."

BASED ON PRICES AS OF AUGUST 15, 1948.

daily requirements.

Some of the mixtures suggested by Dr. Becker and Dr. Kirk for dairy and beef cattle respectively, are given in Tables 3 and 4.

Many dairymen prefer feeds with a greater variety of ingredients, so for these a combination has been developed as follows:

Citrus Meal	200 lbs.
Citrus Molasses	200 lbs.
Ground Snapped Corn	400 lbs.
Wheat Bran	300 lbs.
Brewers Dried Grains	100 lbs.
Pulverized or Crimped Oats	100 lbs.
Corn Gluten Feed	100 lbs.
Linseed Oil Meal	50 lbs.
Cottonseed Meal	300 lbs.
Peanut Oil Meal	190 lbs.
Mineral Mixture	60 lbs.
& Sharkol	

(1% Salt, 1% Phosphate, 1% CaCO3)

This and similar combinations of 20% protein dairy feeds have been used extensively throughout central Florida and have produced excellent results. Such feeds can be fed with citrus pulp and alfalfa hay without feeding too much citrus products for best results.

Range pellets made of mixtures such as above, have given splendid results for range cattle. A very popular combination is a 16% range pellet made of citrus meal and molasses, ground snapped corn, alfalfa meal, peanut meal, cottonseed meal, mineral mixture and Vitamin A.

Citrus pulp and molasses are now available throughout the year. They are highly desirable feeds both fed separately and in mixed feeds. They

(Continued on page 22)

TABLE 4

SUGGESTED FORMULAE FOUND SUCCESSFUL AND ECONOMICAL FOR FATTENING CATTLE AT THE FLORIDAL RANGE CATTLE STATION, ONA, FLORIDA

	Amounts of Constituents * lbs.	lbs.
Dried Citrus Pulp	1000	800
Citrus Molasses	500	500
Ground Snapped Corn		200
Cottonseed Meal, 36%	500	500
Total Crude Protein (percent)	12.7	13.0
Digestible Crude Protein (percent)	10.0	9.9
Total Digestible Nutrients (percent)	1390	1380

*2% range mineral should be added to these formulae.

TABLE 2

June 9. 1948

TYPICAL ANALYSES

	Citrus (1) Molasses	Cane (2) Molasses	Beet (2) Molasses
Moisture	27.0 %	25.9 %	19.4 %
Brix	73.0 %	79.0 %	79.0 %
Digestible Crude Protein	1.4 %	.9 %	2.5 %
Fat	0.0 %	0.0 %	0.0 %
Fiber	0.0 %	0.0 %	0.0 %
Nitrogen-free Extract	60.0 %	61.9 %	62.6 %
Total Digestible Nutrients	56.7 %	56.6 %	58.8 %
Total Dry Matter	69.90 %	74.1 %	80.6 %
Ash	5.0 %	9.4 %	10.3 %
Potash	.08 %	2.62 %	4.77%
Calcium	.63 %	.56 %	.05%
Magnesium	.42 %		
Phosphorus	.014%	.06 %	.02%
Iron	.015%	.0077%	
Copper	.010%		
Zinc	.006%		
Manganese	.004%		
Boron	.007%		
Cost Per Unit T.D.N. at Point of Production	$.026 Plymouth Fla.	$.045 New Orleans, La.	$.059 Denver Colo.

(1) Florida Agricultural Experiment Station and Plymouth Research Laboratory.
(2) Morrison's "Feeds & Feedings."

TABLE 3

SUGGESTED MIXED DAIRY FEEDS INCLUDING DRIED CITRUS PULP, USUALLY ECONOMICAL IN COST OF NUTRIENTS *

	Amounts of Constituents							
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Dried Citrus Pulp 2	300	300	200	200	200	100	100	100
Ground Snapped Corn	200		200	200		100		100
Corn Feed Meal		300			200		100	
Wheat Bran	300	300	300	200	300	200	200	200
Distillers' Grains, Dried		100		100		100	100	
Cottonseed Meal, 41%	200		200	200	200	200	200	200
Peanut Oilmeal, 43%		200	100	100	100	100	100	100
Total Crude Protein (percent)	16.3	16.8	20.1	20.8	20.4	24.4	24.5	24.6
Digtstible Crude Protein (percent)	12.2	13.0	15.9	16.1	16.2	19.2	19.4	19.8
Total Digestible Nutrients (percent)	72.6	77.3	73.1	73.6	75.8	73.8	75.5	73.5

1. Mineral supplements should be added to these mixed concentrates at the rate of 1 percent salt, 1 percent feeding bonemeal and 1 percent of either marble dust or oyster shell flour.
2. Dried citrus pulp, or dried molasses-citrus pulp, may be used interchangeably.
*From Press Bulletin, 521, October, 1938, "Dried Citrus Pulp in Dairy Rations," R. B. Becker, W. M. Neal, P. T. Dix Arnold, Florida Experiment Station.

Recent Developments In Florida Peach Production

G. H. Blackmon, R. D. Dickey and R. H. Sharpe
Department of Horticulture
Florida Agricultural Experiment Station, Gainesville
Florida State Horticultural Society
West Palm Beach
October 28, 1948

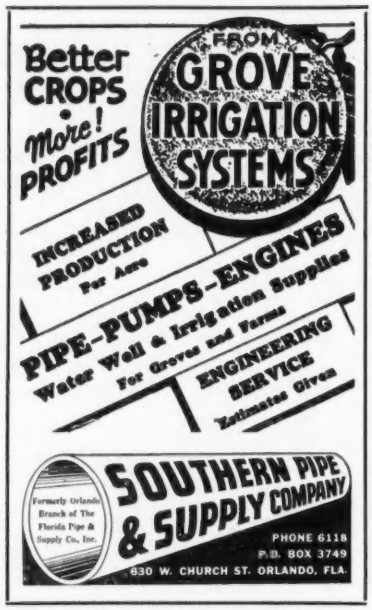
Interest in peach growing in Florida has existed for many years and numerous varieties have been tested. It was discovered that the only varieties which could be grown successfully in the state were those which required little cold weather to cause flowering and subsequent fruit set. Such varieties were found in the Peen-to and South China races, and many trees of these have been planted during past years to give fruit for home use and limited commercial production.

Fortunately there are a few varieties which can be grown in Florida with the mild temperatures which exist. Several of these can be selected according to ripepning dates so that ripe fruit can be had for home use over a longer period of time during the early spring and summer than if only one were planted. However, because of the heavy production in Georgia and South Carolina, only peaches which will mature fruit that can be marketed prior to heavy movements from those areas have a place for commercial production in Florida. The Jewel is best for this purpose since it will mature its fruit sufficiently early in most years to provide ripe fruit before heavy shipments begin from other states.

The Jewel was introduced in 1892 by T. K. Godbey of Waldo, who selected it from a planting of Waldo seedlings. It is a variety belonging to the Peen-to race with average ripening dates of May 10 to 20, but in some years they will be earlier or later than these, depending on weather conditions in the spring. The fruit is freestone, medium in size which can be increased by thinning the crop, rounded to oblong; creamy color, splashed with red; flesh whitish but red about the pit, juicy and of good quality and character; flavor, sweet and pleasing. When the fruit is properly grown, harvested and handled, it generally can be readily sold on local and out-of-state commercial markets.

Recommendations for planting peaches in Florida have emphasized the necessity of setting trees on newly cleared land or to use plum stocks to prevent losses from root-knot nematodes. It is not always possible to have available such newly cleared land for planting the peach orchard, even though it is the only safe place to set trees, except in certain locations about the home where nematodes are not quite so abundant. There are now several chemicals and treatments that seem to be promising in helping to overcome this problem. If they do work satisfactorily in reducing nematode injury, it will then be possible to use land which has previously been in cultivation.

Since the introduction of chemicals that will kill nematodes, extensive investigations have been conducted with them as soil fumigants where peaches were to be planted. Most of this work has been done in other states but some work has been conducted in Florida. At Tifton, Georgia, the Coastal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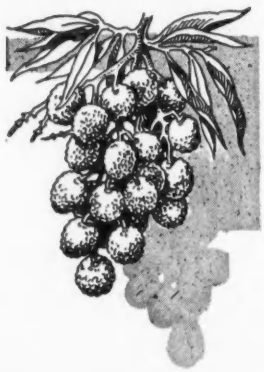


LYCHEE ORCHARDS
INCORPORATED
LAUREL Sarasota County FLORIDA

Plains Experiment Station has conducted numerous tests using different chemicals injected into the soil at different depths.

In order to test the effects of soil fumigants on nematodes in Florida soils, two experiments are being conducted with Jewel peaches. One of these has been going for two years and the other for one year. In 1946 an experiment was set up at Whitney on the Experimental Farm of the Florida Station's Watermelon and Grape Laboratory at Leesburg. This experiment was set up to study the effects of chemicals in killing nematodes in soil that was known to be heavily infested with root-knot. The chemicals were injected into the soil prior to planting the trees. Treatments included DD, chloropicrin, check and organic mulch, without a soil fumigant. The fumigants were applied in December 1946, to an area 8 feet in diameter at each tree location. In January, 1947, trees of the Jewel variety were planted at all locations, and in the case of the fumigated areas the trees were set in the center of that treated. Native grass and indigo were used as the mulching materials around five of the trees in the unfumigated soil.

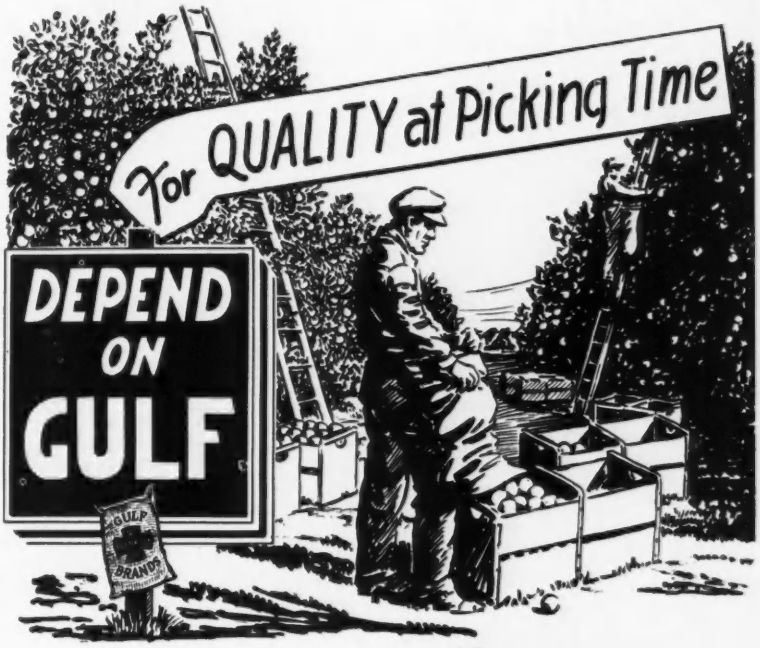
During 1947 and 1948 the growth and condition of the trees in all plots were recorded. In both years the growth has been better in the plots treated with fumigants than it was in the untreated check. However, the mulch treatment has been somewhat better than the fumigation in that the over-all growth of the trees has been just as good and this year the trees have held their leaves later than those where no mulch was applied. This presents an interesting situation regarding the use of mulches in various types of peach plantings, and it is being investigated further in the experiment at Gainesville.

(Concluded Next Month)

FEEDING CITRUS MOLASSES

George Terry, Orange County cattleman, is feeding citrus molasses from 100 20-foot troughs on his ranch southeast of Orlando, according to County Agent F. E. Baetzman. He already has two 100-gallon tanks for storage of citrus molasses and he is now installing two more.

Think ... NOW about the next crop!



Now is the time to plan ahead for the crop you hope to harvest next season. The care your grove receives in the months to come will be a vital factor in crop results. It takes GOOD Fertilizer to grow good crops — and the GULF Field Man in your section will recommend a dependable, economical program "tailor made" to fit the needs of your grove. Ask him to call. His recommendations will include nationally-tested SHERWIN-WILLIAMS AGRICULTURAL CHEMICALS for disease and pest control.

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Reports Of Our Field Men . . .

POLK COUNTY
J. M. (Jim) Sample

Most of this territory is experiencing a very severe dry spell with trees wilting and much fruit dropping. Irrigation is being done where possible some growers are moving fruit that they would ordinarily hold for later shipment. In spite of the drought many growers are going forward with their spring application of fertilizer knowing that it will be ready to go to work when we have some moisture and the trees begin to bloom. There is a general feeling of optimism throughout this section over the prospects for fair prices during the remainder of this season, and even for our crop next year. The spray program this spring will be one to keep fruit clean of all diseases and insects in an effort to have a crop of high quality fruit for next shipping season. Many groves in the County have a considerable crop of late bloom fruit and this fruit now seems to be developing real quality.

WEST CENTRAL FLORIDA
E. A. (Mac) McCartney

Growers throughout this section feel that it is bad to profit from the misfortunes of other citrus producing sections but are happy that fruit prices have shown a marked improvement over the past two years. From the many reports that have come to us it would appear that the fruit crop will be light in other states next year, so with this in mind growers are getting their trees in the best of condition to set a good crop of fruit this spring. Generous application of fertilizer has been applied and most growers will follow through with a complete spray program. Vegetable growers in all of the producting sections are going forward with their spring crops and they are looking good. As to acreage, this will be about the same as was planted last spring. The dry hot weather has done some damage, but on the whole all crops are in good shape. The acreage of watermelons will be about the same as last year. The spray program on melons will be carried through very thoroughly this spring to control diseases in an effort to prevent a recurrence of the damage done by various fungus diseases last year.

NORTH CENTRAL FLORIDA
V. E. (Val) Bourland

Conditions in this territory are a great deal different from what they were at this same time for the past two years. We are getting fair prices for all varieties of our fruit at the present time and most growers are of the opinion that prices will be better as the season moves along. This territory is suffering from dry weather and there is a heavy droppage of fruit, with the late bloom fruit showing more droppage than the earlier bloom. Grapefruit in particular is dropping excessively. Growers have been giving their properties ample quantities of fertilizer and are planning a complete spray program during the spring and summer months. Through cucumbers are looking good and field cucumbers are now being planted. Other vegetable crops are being planted in about the same proportion as to acreage as we had last year.

HILLSBOROUGH AND PINELLAS COUNTIES
C. S. (Charlie) Little

The dry weather of the past few months has caused a loss of many thousands of dollars to the fruit growers in this territory. We have worked this area for the past 15 years and never have we seen as much fruit droppage as we have this spring. Grapefruit is showing the heaviest loss but there is also heavy droppage of valencia oranges. Fruit prices are somewhat better and considerable fruit is being moved to market, but those growers equipped with irrigation are planning to hold their valencias until later in the season with the hope that prices will be better. For the first time in about two years there is a great deal of activity by the on-the-tree buyers, but they are not finding fruit too easy to get at this time. We have been going forward with our spring application of fertilizer and following this with plenty of cultivation. Our spray program will be carried through in detail, with main emphasis on the control of scale insects. For the past few years we have had a real fight with these pests, and in some instances as many as three applications of oil has been applied.

SOUTHWEST FLORIDA
Eaves Allison

With tomato prices holding up even for very poor quality growers have picked fruit that ordinarily would have been plowed under. However, the fall crop is now over and everyone is busy with their spring crops. This spring will see large acreages of all varieties of vegetable crops planted. The most important crops will be tomatoes, cucumbers, squash, sweet corn and a number of leafy plants. Gladioli growers have had a very successful season throughout the territory from Ruskin to Ft. Myers. Citrus growers have been busy with irrigation plants in an effort to get sufficient water on the groves to prevent excessive droppage. This drought has been very serious in all of the citrus sections of the territory, and the loss from droppage has caused a heavy financial loss.

SOUTH POLK, HIGHLANDS AND HARDEE COUNTIES
R. L. (Bob) Padgett

It has been necessary to make heavy movements of fruit from this territory because of the very serious drought. This is probably the driest section of the state and many groves from Lake Placid on north as far as I work are suffering to the extent that in some cases we will lose wood unless rain comes at an early date. Fruit is getting very soft and the droppage is severe. The dry weather has affected most all grove work, and there has been very little fertilizer applied. Those growers that can irrigate are running their equipment around the clock. The Lake Istokpoga section after being too wet to plant during the fall season, now has operations under way and crops are looking good.

AGRICULTURE IN SOUTHWEST FLORIDA

By Eaves Allison, Salesman

If the prairie states of the west are known as the "nation's breadbasket" then this southwest Florida territory should be called the winter vegetable bin. For, besides being a tourist playground, this area from Ruskin, in south Hillsborough County, down south to Ft. Myers produces thousands of carloads of fall and winter vegetables which are shipped to the snowbound north from early fall on through the winter until well into May.

Tomatoes, cucumbers, squash, peppers, pole beans, lettuce, escarole, cauliflower, celery, sweet corn, egg plants, potatoes, broccoli are some of the vegetable crops that are scientifically grown in vast quantities over a large acreage with Palmetto, Bradenton and Sarasota as the geographical center. In addition to this section's big vegetable business it has become the largest producing area for gladioli in the country. Many acres, from Sun City on the north to Iona, below Ft. Myers, are devoted to this popular flower crop. The latter city has become known as the winter gladioli capital of America. Also in the Ft. Myers-Iona area are located some of the state's largest potato growing operations. It is significant that many of the finest crops of vegetables and flowers are grown with Lyons fertilizer.

Also in this section are grown some of the best flavored oranges and grapefruit to be found in the world. A premium is paid in the country's markets for Manatee and Lee county grapefruit, both the canned juice and the fresh fruit. And anyone who has not tasted ripe Lee county pineapple oranges from the Caloosahatchee valley-Estero-Bonita Springs area has something to learn about oranges. These delicious fruit smell so good on the tree that it is impossible to walk past without eating one.

Inland, at Arcadia on the eastern boundary of this section are some of the oldest citrus groves in the state—some seedling orange and grapefruit groves being over one hundred years old. This section is also renowned for the excellent quality of its citrus fruit. Also there is developing here one of the newest and most important early watermelon areas in Florida. DeSoto county melons are just a little ahead of older producing areas, due to being on the southernmost fringe of the melon-producing belt. This permits an earlier planting date and a better chance of carrying through the frost danger period.

All in all, Southwest Florida with its ever increasing swarm of winter visitors, its high-quality, high-yield agriculture and its big cattle industry is a section to keep your eye on. It is with a great deal of pride that we here at Lyons think of our own small part in the development of this thriving section, and of those Lyons customers whom we are proud to think of as the finest growers in their respective fields.

"THE PLACE OF CITRUS BY-PRODUCTS IN THE FEED INDUSTRY"

(Continued from page 17)

are the most economical per unit of total digestible nutrients of any feed ingredient produced. When their use is as well understood by feed users and mixers throughout the state and the United States as it is in a comparatively small area now, it is doubtful if there will be enough citrus pulp and molasses produced to supply the demand.

MAKE CITRUS PIES

Putnam County negro home demonstration club women are learning how to make citrus pies as a result of recent demonstrations by Lee Ella Gamble Asia, negro home agent.

NEW HARMONE LESSENS FROST DAMA GE

(Continued from page 15)

ing this kind of response to the hormone compound. Blossoms on tomatoes grown by a Naval Air Station appeared and set fruit two weeks earlier with the treatment in the irrigation water, he mentioned.

He revealed that the U. S. Department of Agriculture's Emergency Guayule Rubber Project at Salinas, California, was the first to observe, during World War II, the effect of the Horms No. 4 in causing earlier maturity of guayule rubber seedlings. The U. S. Army also noted the same earlier development, he said, on camouflage growing during the war, with some of the first of the new material.

"Useful hormone treatments of various types have now been mapped out by the Vitamin Institute for nearly every crop execpt honey," Tomson remarked.

"For many years now, man has known appreciably more each year about how to use hormone substances to control plant activities," he said, and predicted that "next year, and each succeeding year for many years in the future, new growing problems will be solved through hormones research either already in progress, or still unconceived."

Approximately 100 representatives of leading nursery, landscape, orchard and other horticultural groups heard his talk at the Beverly Hills American Legion Hall before a meeting of the Hollywood Horticultural Society, many of the members of which announced in turn the favorable responses each had met, in extensive tests with Horms No. 4.

In response to inquiries, Thomson said the new hormone compound, although now used already on an estimated 50,000 acres in California, was released for general use for the first time in some states in 1948, and is scheduled for release to the balance of those so far unsupplied during 1949 and 1950.

A word of caution was offered by Thomson in connection with use of the hormone to help "bring back" shrubs or trees damaged but not killed by such a freeze as the which recurrently has gripped normally frost-free locations in California this January.

Thomson stated that a majority of growers experimenting with the substance for the purpose have concluded that it works better to wait until danger of returning freezing weather is presumably past before application or pruning.

Reasons for not being too hasty to "doctor" the bushes and trees, he said, are that it is better for newly promoted growth to be formed after passing of the peril of its being frozen too, and it is better for pruning to be reserved until it is possible to be surer just how far die-back has reached.

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